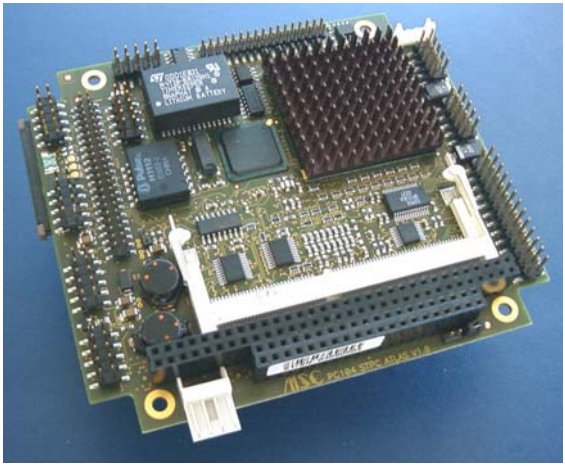
MSC PC/104
STPC Atlas

User's Manual

Version 0.2



09 / 12 / 2003

MSC Vertriebs GmbH
Design Center Neufahrn

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Important Information

This product is not an end user product. It was developed and manufactured for further processing by trained personnel.

EMC Rules

This unit has to be installed in a shielded housing. If not installed in a properly shielded enclosure, and used in accordance with the instruction manual, this product may cause radio interference in which case the user may be required to take adequate measures at his or her own expense.

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1. General Information

1.1. Introduction

The PC/104 STPC Atlas is an all-in-one single board computer card for the PC/104 bus .

With an onboard LCD/CRT SVGA controller and an 100BaseT Ethernet controller, the PC/104 STPC Atlas packs all the functions of an industrial computer and its display capabilities onto a single card. This makes the PC/104 STPC Atlas an ideal solution for embedded applications.

The PC/104 STPC Atlas is based on the STPC Atlas processor of ST Microelectronics.

The PC/104 STPC Atlas supports 3,3V SDRAM. It provides a 144-pin standard SO-DIMM socket giving you the flexibility to configure your system with up to 128 MB SDRAM memory.

The integrated flat panel/CRT SVGA controller shares up to 4 MByte Video Memory (UMA) with the CPU. The CRT Controller has a 135MHz RAMDAC . The flat panel controller can directly drive TFT displays.

Another onboard device is the 100MBit PCI Ethernet controller (82551ER).

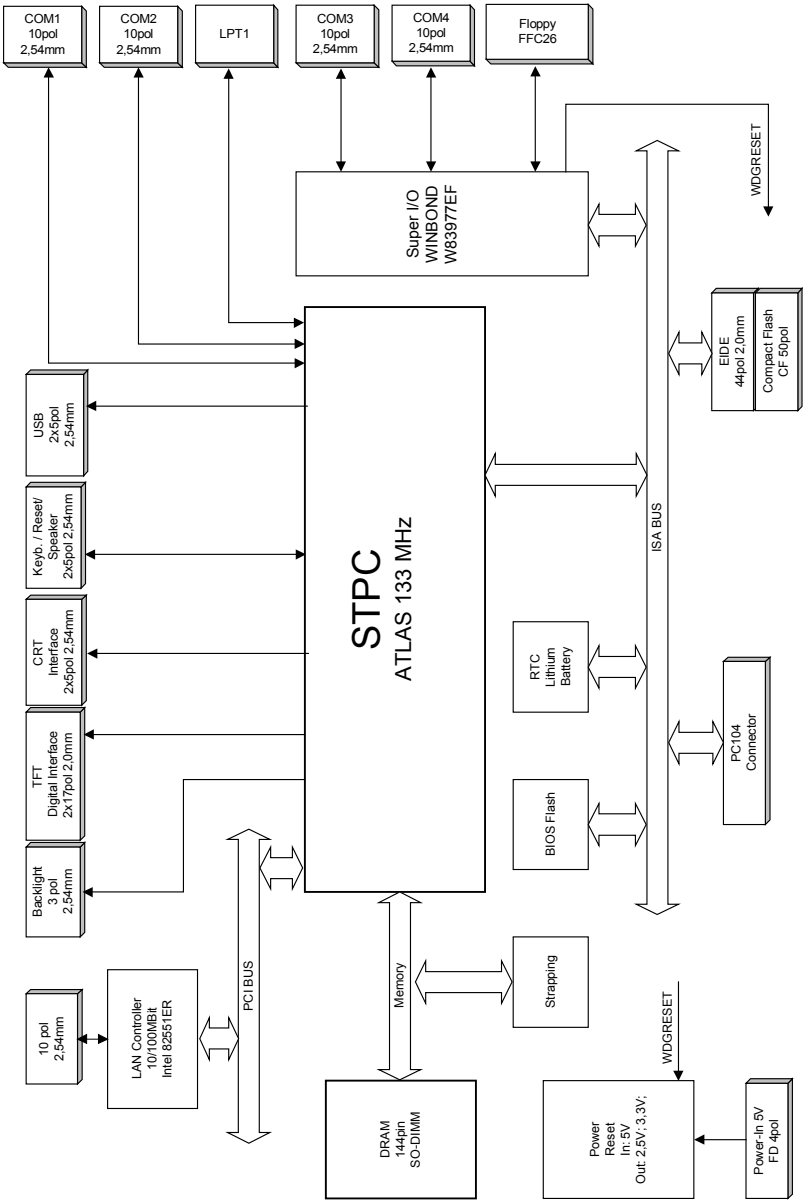
The PC/104 STPC Atlas includes an IDE controller (44pin, 2mm connector) and a floppy interface (26pin FFC connector) .

A CompactFlash socket (solder side) is provided .

Onboard features include four RS-232 serial ports, two USB 1.1 ports, one bidirectional SPP/EPP/ECP parallel port and a PS/2 keyboard/mouse interface.

The real time clock is buffered by a removable lithium battery.

1.2. Block Diagram



1.3. Hardware Specifications

Enhanced x86 CPU with 64 bit local bus

8Kbyte data cache (write back)
Clock core speed 133 MHz
2,5V core power supply

Integrated 64 bit DRAM Controller

Integrated SVGA Graphics Controller

UMA Architecture
CRT Controller ,135MHz RAMDAC
TFT Display Controller
Digital interface 18 Bit
Serial interfaces COM1/2, RS232
2 USB 1.1 ports

Integrated standard PC/AT keyboard controller

144pin 64bit SO-DIMM socket (up to 128 MByte SD RAM)

ISA Bus for PC/104 standard

10/100 MBit Ethernet Controller (RJ45 Interface)

Super-I/O (W83977EF)

IDE master/slave interface für HDD and/or CD-ROM
Floppy Disk Interface
Serial interfaces COM3/4, RS232
Parallel interface LPT1
Watchdog

Reset Controller

Real Time Clock with removable Lithium battery ("Snap Hat")

FlashBIOS

Single 5 V power supply

CompactFlash socket

Connectors for

- PC/104 ISA bus
- IDE
- Floppy
- COM1 (RS232)
- COM2 (RS232)
- COM3 (RS232)
- COM4 (RS232)
- LPT1 (Centronics)
- USB (1/2)
- PS/2 keyboard, PS/2 mouse, Speaker, Reset
- CRT
- TFT (Digital interface)
- LCD Inverter Power
- RJ45 Ethernet
- Power Supply

Power supply:

+5V	*±5%*	
+12V	*±5%*	*required for PC/104 modules only*

Supply current (typ.) :

+5V	*1 A*	*133 MHz CPU*
+12V		*depends on PC/104 modules*

Environment:

Temperature	operating	0 .. + 60°C
	non operating	-25 .. + 85°C
Humidity (rel.)	operating	20 - 80 %
	non operating	5 - 95 %

Dimensions:

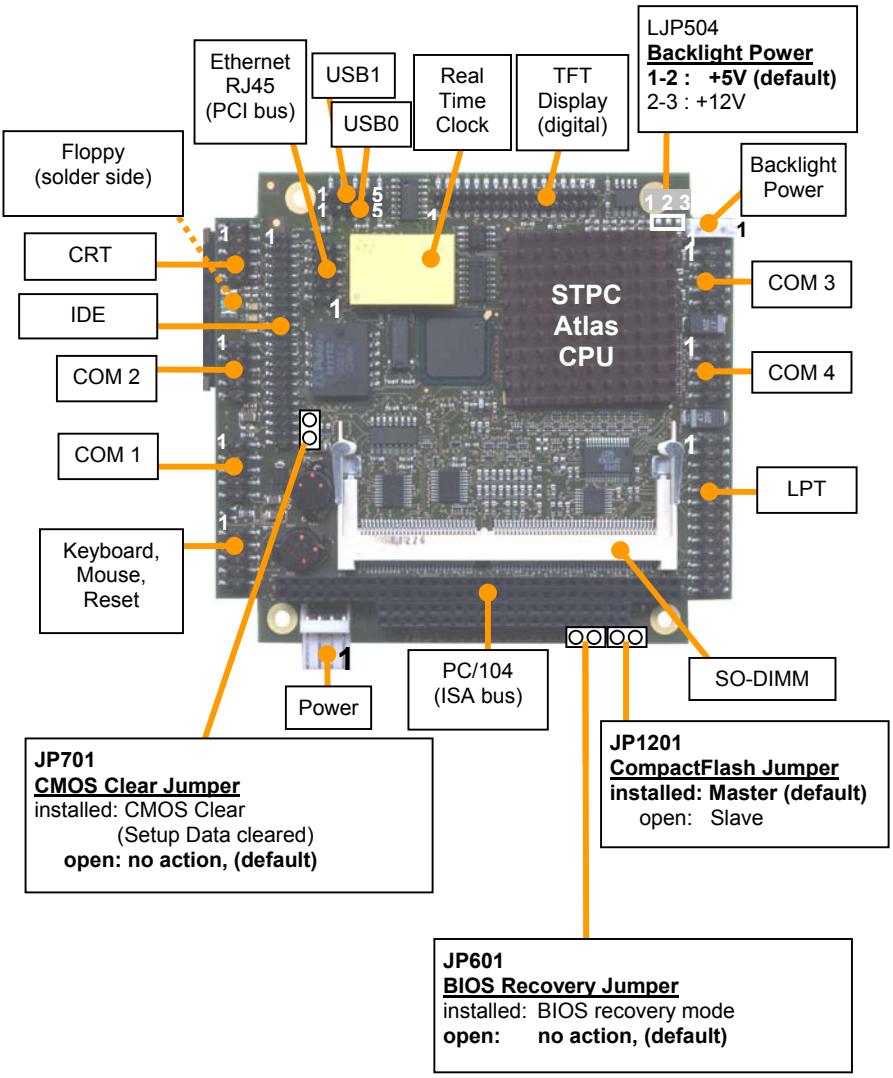
90 x 96 mm
115,4 x 96 mm (connector area)

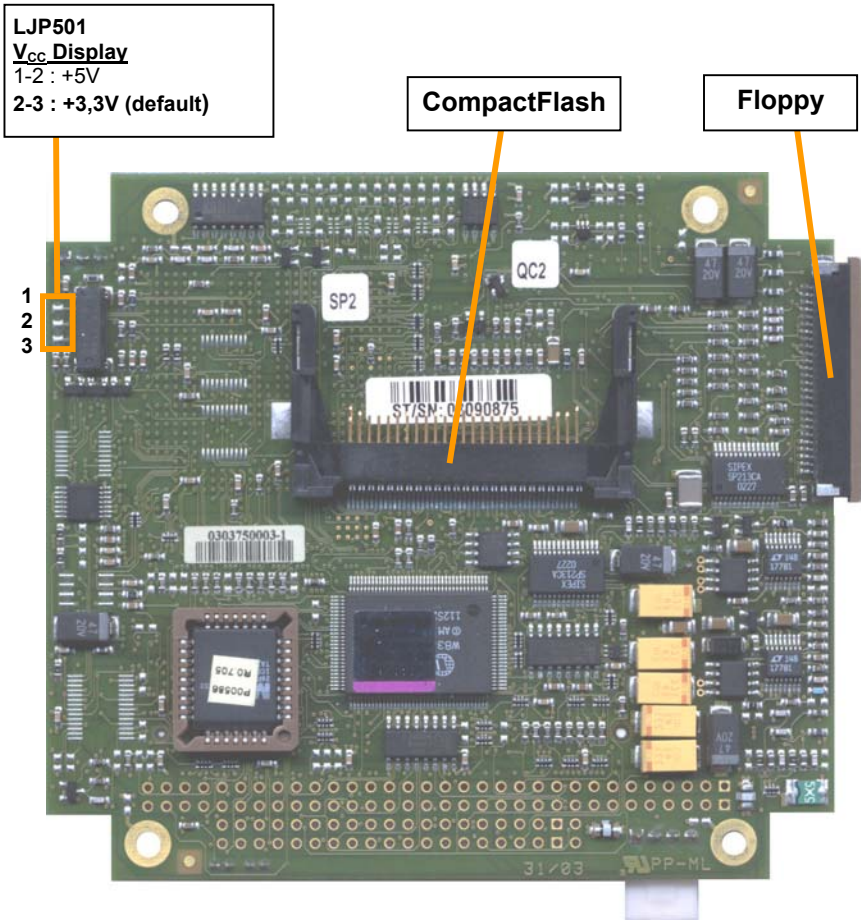
1.4. BIOS

PhoenixBIOS 4.0:

- Plug & Play (PCI, ISA)
- PCI Auto Konfiguration (PCI 2.1)
- Advanced Power Management 1.2
- BIOS Update via floppy incl. Crisis Recovery in case of a damaged system BIOS
- Quick Boot
- System and Setup Password

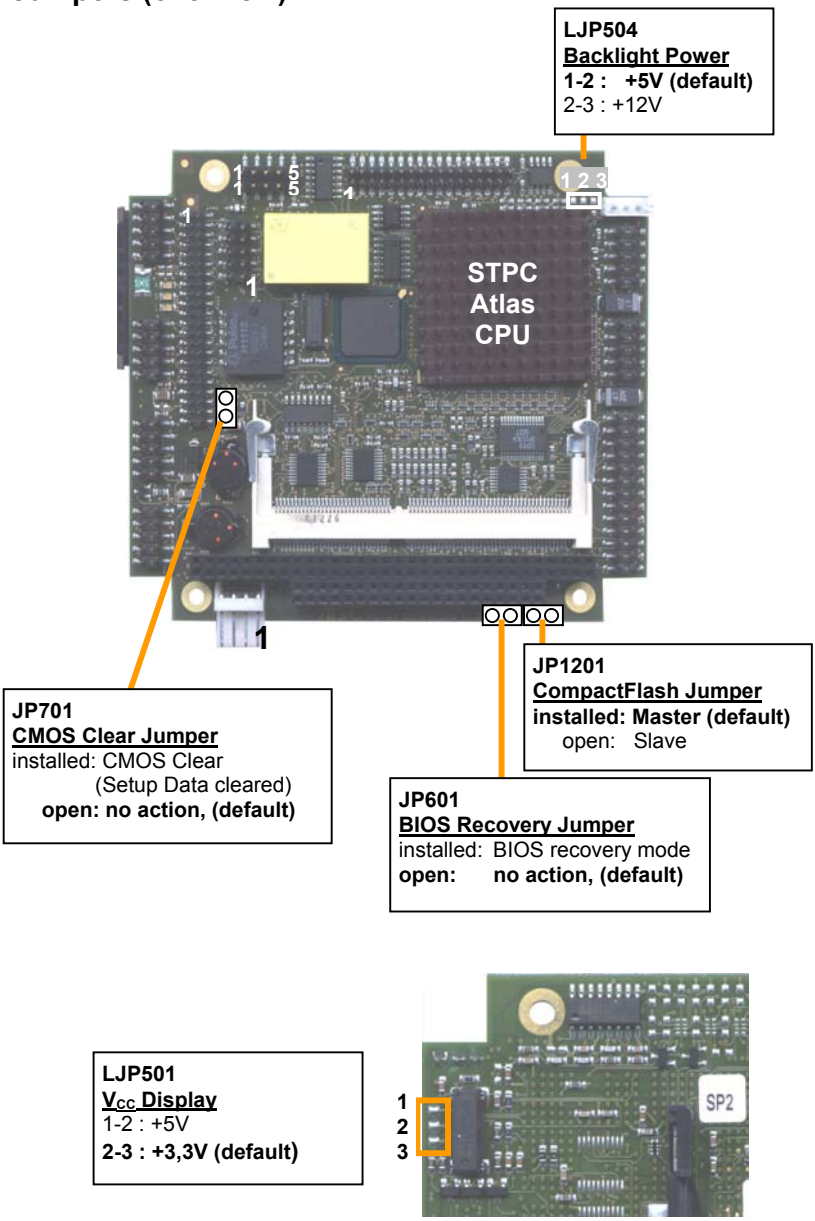
1.5. Board Layout



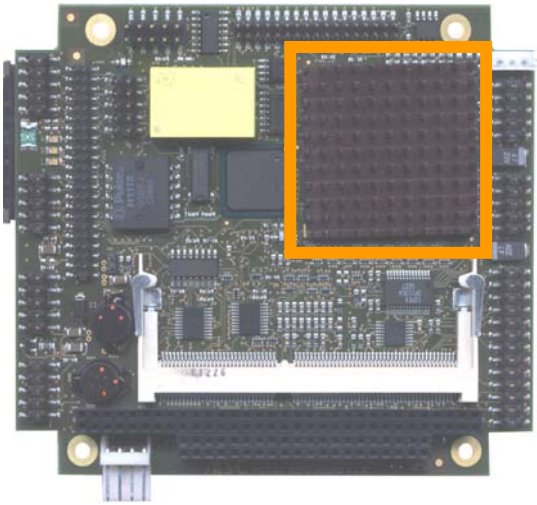

LJP501
V_{CC} Display
1-2 : +5V
2-3 : +3,3V (default)
CompactFlash
Floppy
1
2
3
SP2
QC2
0303750003-1
31/03
PP-ML

2. Installation

2.1. Jumpers (overview)



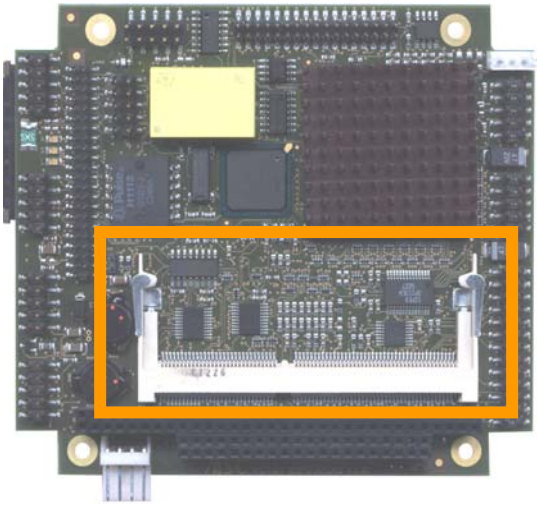
2.1.1. CPU



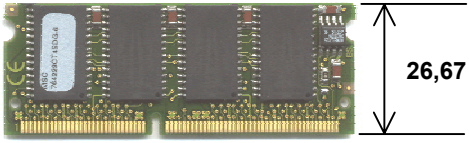
The PC/104 STPC Atlas CPU card is based on the STPC Atlas CPU from ST Microelectronics. The processor runs at 133 MHz (100MHz Front Side Bus) with a core voltage of 2.5 V .

The STPC Atlas integrates a fully static x86 processor, fully compatible with standard fifth generation x86 processors, and combines it with powerful chipset, graphics, TFT, PC-Card, Local Bus, keyboard, mouse, serial and parallel interfaces to provide a single industrial oriented PC compatible subsystem on a single device. The performance is comparable with the performance of a typical P5 generation system. The device is packaged in a 516 Plastic Ball Grid Array (PBGA).

2.1.2. Installing a DRAM SO-DIMM module



The PC/104 STPC Atlas board has a SO-DIMM socket for standard 3,3V SDRAM SO-DIMM modules :



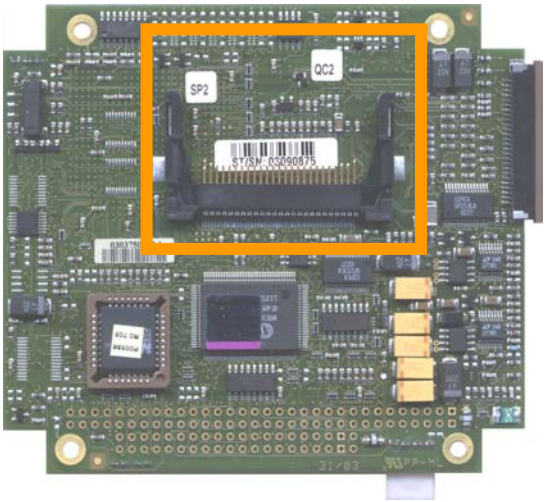
Module organization	Capacity
4M x 64	32 MByte
8M x 64	64 MByte
16M x 64	128 MByte

Standard PC100 or PC133 SDRAM modules can be used.

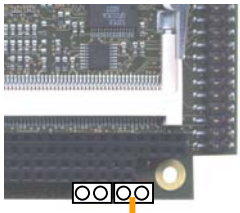
The module height is mechanically limited by the heatsink of the processor, it must be less or equal 1050 mil (26.67 mm).

2.1.3. CompactFlash Socket

The board is equipped with a type I CompactFlash socket (solder side).

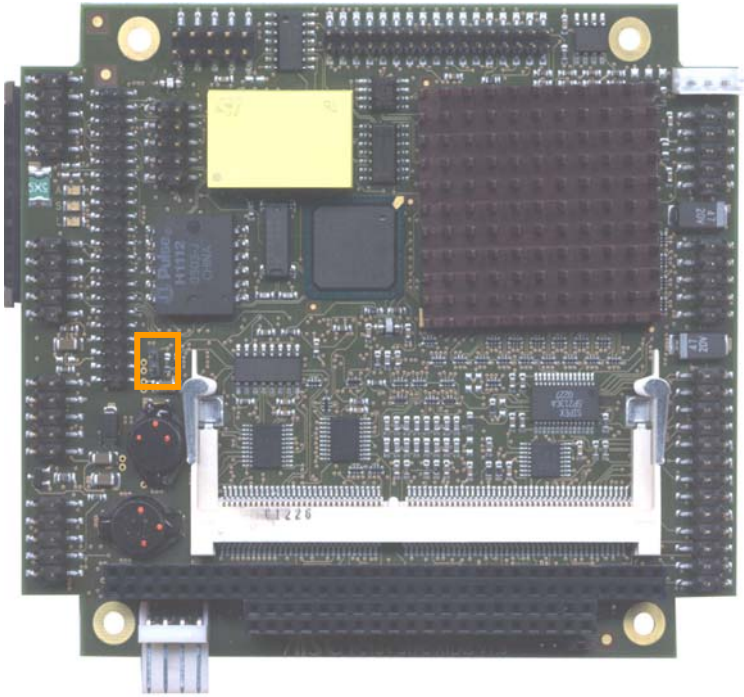


The CompactFlash device can be jumpered as master or slave :



JP1201
CompactFlash Jumper
installed: Master (default)
open: Slave

2.1.4. Clear CMOS Jumper

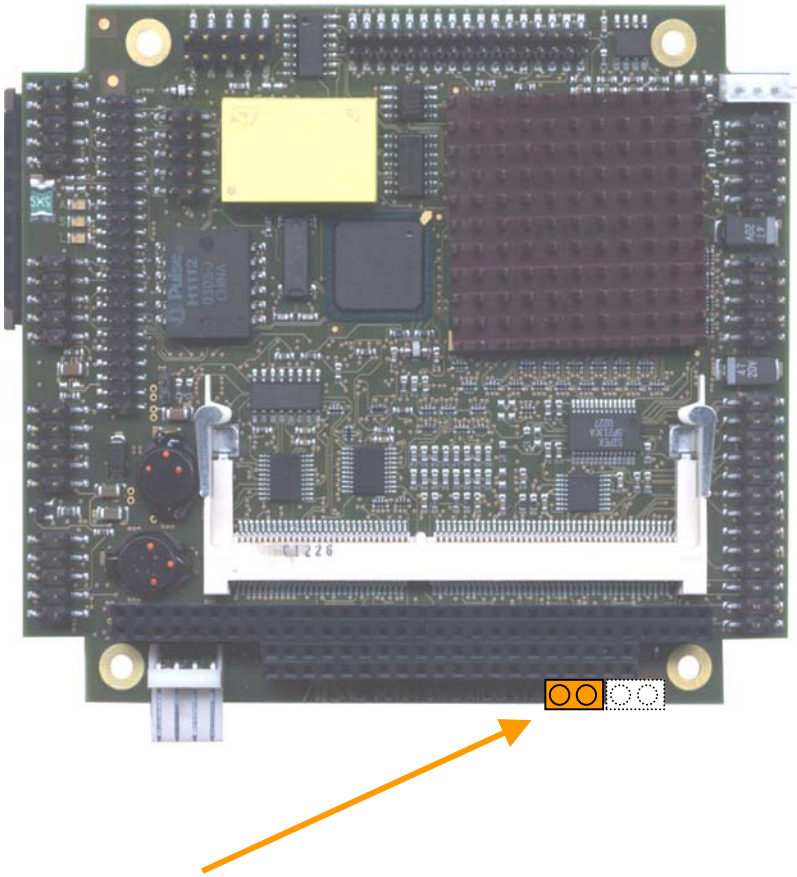


Clear CMOS Jumper :

To clear the contents of the CMOS (setup configuration) the following procedure has to be done :

1. Switch on power
2. Install jumper for a few seconds
3. Remove jumper

2.1.5. BIOS Flash Recovery Jumper



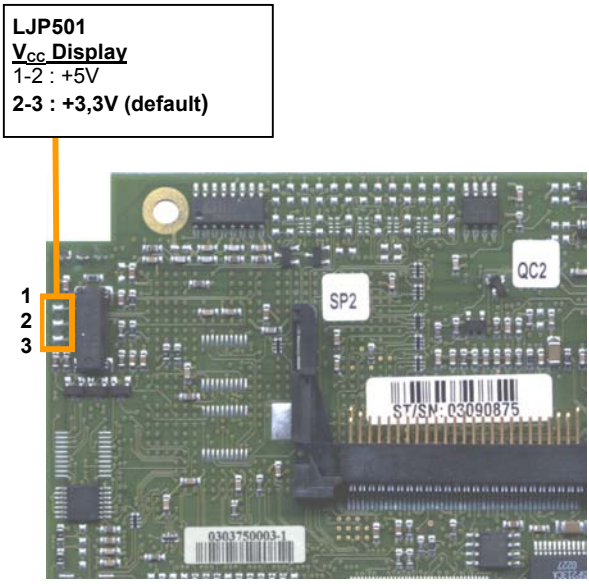
BIOS Flash Recovery Jumper :

If installed, the BIOS Flash Recovery Jumper forces a Flash BIOS update via floppy disk.

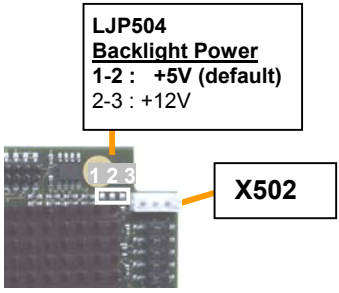
2.1.6. Display Interface

The PC/104 STPC Atlas has an integrated 18Bit TFT (1 pixel/clock) interface (connector X503).

The power supply for the display can be set to 3.3V (default) or +5V via solder jumper LJP501 :



Connector X502 provides backlight power +5V or +12V , selected by solder jumper LJP504 :



2.2. Watchdog

A watchdog function is implemented in the W83977EF Super I/O.

If the watchdog is enabled a counter is started which creates a reset if it is not retriggered within a specified time window.

The time window can be set to 1..255 seconds or to 1..255 minutes.

Here is a sample program for setting up the watchdog :

Initialisation :

```
mov dx,370h          ;enter configuration mode
mov al,87h
out dx,al
out dx,al

mov dx,370h          ;configure GPIO16
mov al,2ch
out dx,al
inc dx
in al,dx
and al,0cfh
or al,10h
out dx,al

mov dx,370h          ;Device 7
mov ax,0707h
out dx,ax
mov ax,0ae6h
out dx,ax

mov ax,0807h         ;Device 8
out dx,ax

mov ax,0130h         ;activate device
out dx,ax
```

```
;Use following sequence if watchdog counter counts in seconds
;otherwise it counts in minutes (default)

        mov dx,370h
        mov al,0f4h
        out dx,al
        inc dx
        in al,dx
        or al,40h
        out dx,al               ;end of sequence

        mov dx,370h             ;load and start counter
        mov al,0f2h
        out dx,al
        inc dx
        mov al,Count
        out dx,al

        mov dx,370h             ;exit configuration mode
        mov al,0aah
        out dx,al
        ret


;Retrigger sequence

        mov dx,370h             ;enter configuration mode
        mov al,87h
        out dx,al
        out dx,al

        mov dx,370h             ;load and start counter
        mov al,0f2h
        out dx,al
        inc dx
        mov al,Count
        out dx,al

        mov dx,370h             ;exit configuration mode
        mov al,0aah
        out dx,al
        ret
```

2.3. Interrupts, DMA channels, Upper memory

IRQ	used for	available	comment
0	Timer 0	No	
1	Keyboard	No	
2	Slave 8259	No	
3	COM2	No	
4	COM1	No	
5	-	Yes	
6	Floppy Disk Controller	No	(1)
7	LPT1	No	(1)
8	Real Time Clock	No	
9	(Ethernet Controller)	(Yes)	(2)
10	-	Yes	
11	-	Yes	
12	PS/2 Mouse	No	
13	Floating Point Unit	No	
14	IDE0	No	(1)
15	-	Yes	

(1) If the device is disabled in SETUP, the interrupt is available.
(2) If the PCI-Ethernet controller is present, typically IRQ9 is allocated by the BIOS. This can be changed via SETUP.

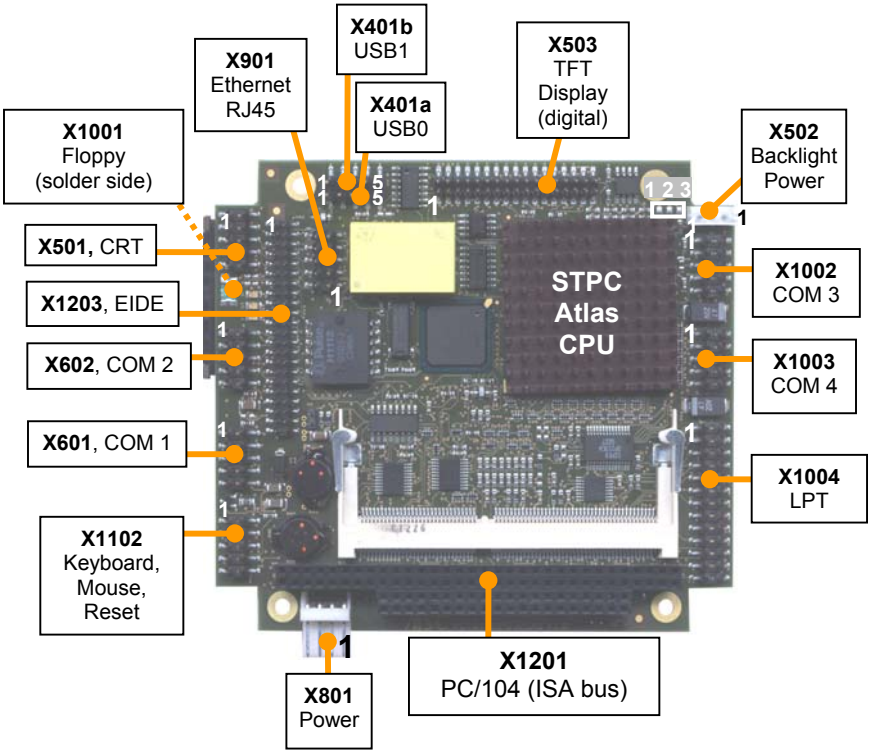
DMA channels :

DMA	used for	available	comment
0	- - -	Yes	
1	- - -	Yes	
2	Floppy Disk Controller	No	
3	- - -	Yes	
4	Cascade	No	
5..7	- - -	Yes	

Upper Memory Map :

Upper Memory	used for	available	comment
C0000h..C7FFFh	VGA BIOS	No	
C8000h..EBFFFh		Yes	ISA bus or shadow RAM (DiskOnChip)
EC000h..EFFFFh		(Yes)	Used by System BIOS during POST
F0000h..FFFFFh	System BIOS	No	

2.4. Connectors



2.4.1. Connector types

Connector	Pins	Type
LCD Backlight Power	3	JST B3B-EH-A
Power	4	AMP 171826-4
PC104	104	stack through, 2.54mm
IDE	44	SMT, 2mm, pin header
Floppy	26	FFC, Weitronic 553-1-26-20-10
LPT1	26	SMT, 2.54mm, pin header
COM1	10	SMT, 2.54mm, pin header
COM2	10	SMT, 2.54mm, pin header
COM3	10	SMT, 2.54mm, pin header
COM4	10	SMT, 2.54mm, pin header
USB0	5	SMT, 2.54mm, pin header
USB1	5	SMT, 2.54mm, pin header
CRT Interface	10	SMT, 2.54mm, pin header
Keyboard/Mouse/Speaker/Reset	10	SMT, 2.54mm, pin header
LAN TBASE100/10	10	SMT, 2.54mm, pin header
TFT Interface	34	SMT, 2 mm, pin header

2.4.2. X1201 PC/104 (ISA)

Pin	A	B	C	D
0	—	—	GND	GND
1	/IOCHCK	GND	SBHE#	MEMS16#
2	SD7	RESET	LA23	IOCS16#
3	SD6	+5V	LA22	IRQ10
4	SD5	IRQ9	LA21	IRQ11
5	SD4	(-5V)*	LA20	IRQ12B
6	SD3	DRQ2	LA19	IRQ15
7	SD2	(-12V)*	LA18	IRQ14
8	SD1	/0WS	LA17	DACK0#
9	SD0	+12V	MRDC#	DRQ0
10	IOCHRDY	GND	MWTC#	DACK5#
11	AEN	/SMEMW	SD8	DRQ5
12	SA19	/SMEMR	SD9	DACK6#
13	SA18	/IOWC	SD10	DRQ6
14	SA17	/IORC	SD11	DACK7#
15	SA16	/DACK3	SD12	DRQ7
16	SA15	DRQ3	SD13	+5 V
17	SA14	/DACK1	SD14	MASTER#
18	SA13	DRQ1	SD15	GND
19	SA12	/REFSH	KEY	GND
20	SA11	SYSCLK	—	—
21	SA10	IRQ7	—	—
22	SA9	IRQ6	—	—
23	SA8	IRQ5	—	—
24	SA7	IRQ4	—	—
25	SA6	IRQ3	—	—
26	SA5	/DACK2	—	—
27	SA4	TC	—	—
28	SA3	BALE	—	—
29	SA2	+5V	—	—
30	SA1	OSC	—	—
31	SA0	GND	—	—
32	GND	GND	—	—

(-12V)*, (-5V)* : -12V, -5V not supported

2.4.3. X1203 EIDE

44pin , 2mm pin header

Pin	Name	Pin	Name
1	/IDE-RESET	2	GND
3	DATA7	4	DATA
5	DATA6	6	DATA9
7	DATA5	8	DATA10
9	DATA4	10	DATA11
11	DATA3	12	DATA12
13	DATA2	14	DATA13
15	DATA1	16	DATA14
17	DATA0	18	DATA15
19	GND	20	n.c.
21	n.c.	22	GND
23	/IDEIOW	24	GND
25	/IDEIOR	26	GND
27	IORDY	28	BALE
29	n.c.	30	GND
31	INTRQ	32	/IOCS16
33	IDEADR1	34	n.c.
35	IDEADR0	36	IDEADR2
37	/IDECS0	38	/IDECS1
39	/IDEACTIV	40	GND
41	+5 V	42	+5 V
43	GND	44	reserved

2.4.4. X1001 Floppy

FFC connector	
Pin	**Name**
1	+5V
2	INDEX#
3	+5V
4	DS0
5	+5V
6	DSKCHG
7	n.c.
8	n.c.
9	n.c.
10	MTR0
11	nc
12	DIR#
13	n.c.
14	STEP#
15	GND
16	WDATA#
17	GND
18	WGATE#
19	n.c.
20	TRK0#
21	n.c.
22	WRTPRT#
23	GND
24	RDATA#
25	GND
26	HDSEL#

2.4.5. X1004 Parallel Port

Pin	Name	Pin	Name
1	STROBE#	2	AFD#
3	D0	4	ERR#
5	D1	6	INIT#
7	D2	8	SLIN#
9	D3	10	GND
11	D4	12	GND
13	D5	14	GND
15	D6	16	GND
17	D7	18	GND
19	ACK#	20	GND
21	BUSY	22	GND
23	PE	24	GND
25	SLCT	26	n.c.

2.4.6. X601 COM 1 (RS232)

Pin	Name	Pin	Name
1	DCD#	2	DSR#
3	RxD	4	RTS#
5	TxD	6	CTS#
7	DTR#	8	RI#
9	GND	10	n.c.

2.4.7. X602 COM 2 (RS232)

Pin	Name	Pin	Name
1	DCD#	2	DSR#
3	RxD	4	RTS#
5	TxD	6	CTS#
7	DTR#	8	RI#
9	GND	10	n.c.

2.4.8. X1001 COM 3 (RS232)

Pin	Name	Pin	Name
1	DCD#	2	DSR#
3	RxD	4	RTS#
5	TxD	6	CTS#
7	DTR#	8	RI#
9	GND	10	n.c.

2.4.9. X1002 COM 4 (RS232)

Pin	Name	Pin	Name
1	DCD#	2	DSR#
3	RxD	4	RTS#
5	TxD	6	CTS#
7	DTR#	8	RI#
9	GND	10	n.c.

2.4.10. X501 CRT

Pin	Name	Pin	Name
1	RED	2	GND
3	GREEN	4	GND
5	BLUE	6	DDC0
7	HSYNC	8	DDC1
9	VSYNC	10	GND

2.4.11. X503 LCD Interface

Pin	Name	Pin	Name
1	GND	2	GND
3	+5V / 3,3V (*)	4	+5V / 3,3V (*)
5	ENVCC	6	GND
7	R0	8	R1
9	R2	10	R3
11	R4	12	R5
13	G0	14	G1
15	G2	16	G3
17	G4	18	G5
19	B0	20	B1
21	B2	22	B3
23	B4	24	B5
25	GND	26	SHFTCLK
27	GND	28	FPLINE
29	FPFRAME	30	DE
31	ENBLIGHT	32	ENVDD
33	DDC CLK	34	DDC SDA

(*) +5V / +3,3V jumper selectable (LJP501)

2.4.12. X502 LCD Inverter Power

Pin	Name
1	+12V / +5V (*)
2	GND
3	PWM

(*) +5V / +12V jumper selectable (LJP504)

2.4.13. X901 RJ45 (Ethernet)

Pin	Name	Pin	Name
1	TX+	2	TX-
3	RX+	4	Floating GND
5	Floating GND	6	RX-
7	Floating GND	8	Floating GND
9	n.c.	10	n.c.

2.4.14. X1102 Keyboard/Mouse/Speaker/Reset

Pin	Name	Pin	Name
1	KData	2	MData
3	GND	4	+5V
5	KClock	6	MClock
7	HDLED	8	Reset IN
9	GND	10	Speaker

2.4.15. X401a USB0

Pin	Name
1	VCC_USB0
2	USB0N
3	USB0P
4	GND
5	Shield_USB0

2.4.16. X401b USB1

Pin	Name
1	VCC_USB1
2	USB1N
3	USB1P
4	GND
5	Shield_USB1

2.4.17. X801 Power

Pin	Name
1	+5V
2	GND
3	GND
4	+12V

3. Appendix : STPCA Adapterboard

The optional available STPCA Adapterboard is connected via flat ribbon cables and provides standard connectors for CRT, LAN, COM1/2, Keyboard, Mouse Floppy, and a reset button.